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Open File Report 88-21

AGGREGATE MARKET STUDY

FOR NEW BRUNSWICK AND NOVA SCOTIA

VOLUME II - FUTURE MARKET CONDITIONS

File 1264-33

by

ADI Limited
Fredericton, New Brunswick

Canada-New Brunswick Mineral Development Agreement
Entente Canada-Nouveau-Brunswick L'Exploitation Minérale

Natural Resources and Energy New Brunswick
Ressources Naturelles et Energie Nouveau-Brunswick
Energy, Mines and Resources Canada
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1988

AGGREGATE MARKET STUDY

FOR NEW BRUNSWICK AND NOVA SCOTIA

VOLUME II - FUTURE MARKET CONDITIONS

This project was funded under the Canada-New Brunswick, Canada-Nova Scotia Mineral Development Agreements, subsidiary agreements under the Economic and Regional Development Agreement.

Project funded by Energy, Mines and Resources Canada.

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1988

Report No.: Open File Report
88-21

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Catalogue No.: ISSN 0712-4562

This report should be referenced in the following manner:

ADI LIMITED. 1988. Aggregate market study for New Brunswick and Nova Scotia, Volume II - Future Market Conditions. New Brunswick Department of Natural Resources and Energy, Minerals and Energy Division, Open File Report 88-21, 48 p.

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1.0 INTRODUCTION

The Phase I report for this study described the current state of the aggregate market in New Brunswick and Nova Scotia. Among the topics covered were production quantities, levels of processing, production cost analyses, a survey of producers, consumption quantities, consumption categories, specifications, and a survey of aggregate consumers.

With this description in mind, the Phase II portion of the study reviewed future prospects for the aggregate markets of New Brunswick and Nova Scotia. The results of this review are in this report; it covers projections of aggregate demand, analyses of aggregate reserves and a review of trends and developments which could affect the quantity, quality and price of aggregate demanded.

2.0 FORECAST OF DEMAND

2.1 Background

A demand forecast for a commodity in a predefined market area may be subject to a wide range of variables, such as population and economic growth within the marketplace, changes in consumer tastes, technological changes and/or product substitution. Aggregates are largely consumed by a fairly narrow and definable group of consumer industries comprising the construction industry--residential and nonresidential building construction and highway and transport structures construction. Aggregates may be consumed as input to concrete mixes (i.e., cement or asphaltic) or used as fill below and/or around highways and structures.

The construction industry is highly dependent upon government policies. The objectives of those policies are: development, growth, renewal, economic stabilization, support infrastructure to achieve acceptable standards of living and high levels of commercial and industrial activity. This dependency on government policies is particularly true in the fields of highways and transport structures construction and, to a lesser extent, the nonresidential building construction industry; indirectly, these policies effect the residential construction sector in the Provinces of New Brunswick and Nova Scotia as well. Due to the importance of the construction industry to their economies, it can be argued that the governments have implicit lower limits to annual levels of construction activity which must be exceeded or sustained to prevent major economic disruption.

2.2 Forecast Approaches

Two approaches have been taken in forecasting the demand for aggregates:

1. trend line projection of historic annual production and consumption levels of aggregate; and

2. projected average economic growth rates of the Provinces' real domestic product times average historic annual production and consumption levels. (Recent economic growth rates for New Brunswick and Nova Scotia have ranged from about 1.0 percent to 3.5 percent per annum; a future average rate of 2.0 percent is assumed for this analysis).

2.2.1 Trend Line Projections of Construction Expenditures

Table 2.1 indicates the annual levels of expenditures in New Brunswick and Nova Scotia by the three primary end consumer groups--residential construction, nonresidential construction, and highways and bridges construction. These values are given in current year dollars but subject to indexing as given. Figures 2.1 and 2.2 indicate the resulting forecasts of the combined building construction expenditures (residential and nonresidential) and highway construction expenditures. The historic trend expenditures in building construction in N.B. would fall to zero by 1997. This, of course, would not occur. Trends in Nova Scotia indicate stable growth for all three sections while New Brunswick's highway construction shows little or no growth. These projections are inconclusive, at any rate, when examining aggregate production/consumption activity, as the proportions of construction expenditures in a given year may vary considerably due to the type or phase of construction of the construction projects.

TABLE 2.1

EXPENDITURES BY PRIMARY AGGREGATE CONSUMER INDUSTRIES*
(STATISTICS CANADA)

Index	Year (1981=100)	Residential Construction		Nonresidential Construction		Highways and Bridges Construction	
		N.B. Dollars (M)	N.S. Dollars (M)	N.B. Dollars (M)	N.S. Dollars (M)	N.B. Dollars (M)	N.S. Dollars (M)
52.8	1974	204.7	189.6	464.6	415.3	—	—
58.5	1975	221.4	203.3	526.2	451.1	—	—
62.9	1976	264.0	269.4	503.1	460.3	—	—
67.9	1977	201.0	249.8	541.4	481.8	—	—
73.9	1978	247.8	276.9	555.0	515.9	—	—
80.7	1979	289.3	268.2	637.0	604.5	—	—
88.9	1980	204.6	245.3	587.5	697.1	—	—
100.0	1981	178.6	284.9	646.4	755.5	124.8	132.6
110.8	1982	128.8	258.6	730.2	1023.0	164.6	155.4
117.2	1983	300.1	425.5	629.2	1238.9	154.4	174.9
122.3	1984	200.1	404.9	792.7	1415.6	186.5	194.5
127.2	1985	—	—	—	—	197.7	218.9
132.4	1986	—	—	—	—	156.7	221.3

*in current dollars

FIG. 2.1
BUILDING CONST. EXPENDITURES FORECASTS

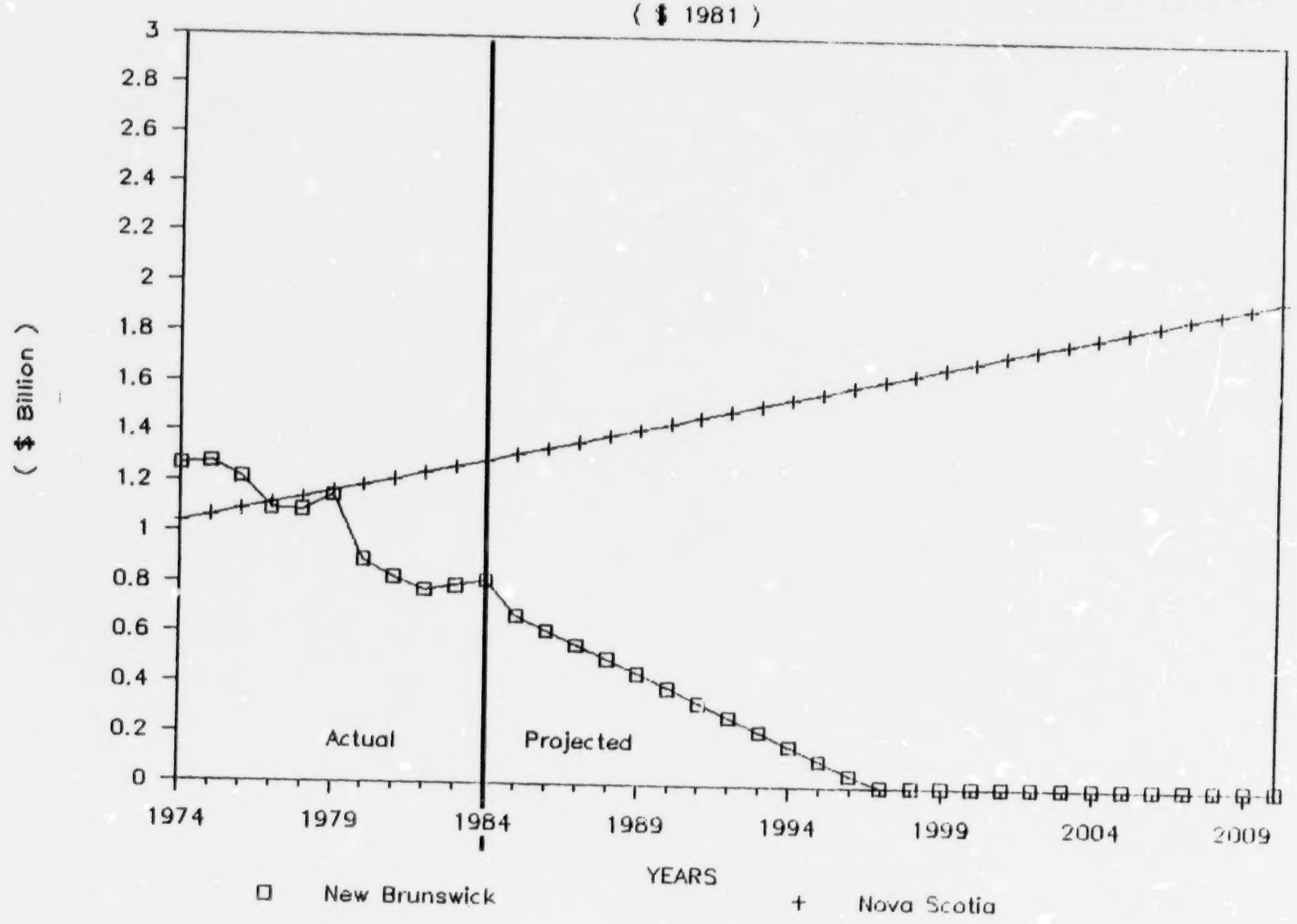
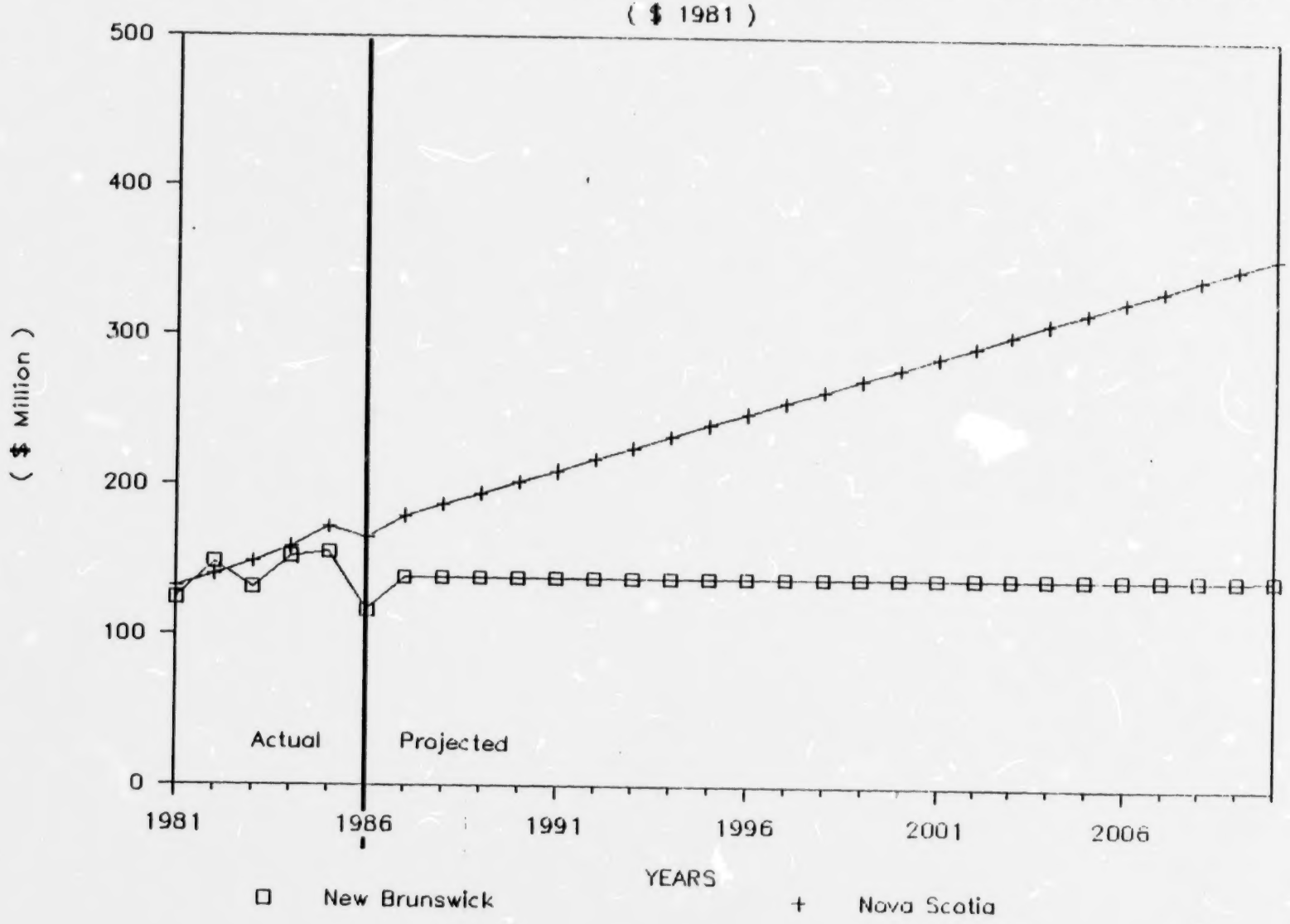


FIG. 2.2

HIGHWAY CONST. EXPENDITURES FORECASTS



2.2.2 Trend Line Projections of Production and Consumption

Table 2.2 presents per annum aggregate production and aggregate consumption for two industries (ready-mix cement and concrete products, highways and transport structures construction by the Provincial Transportation Departments) over the past thirteen years. Figure 2.3 presents the trend projection of aggregate production per province. Figures 2.4 and 2.5 present the trend projections of aggregate consumption by the cement concrete and highways construction industries, respectively.

Using the average historic production and consumption of aggregate levels yield the results given in Table 2.3, below:

TABLE 2.3

ANNUAL AVERAGE PRODUCTION/CONSUMPTION OF AGGREGATES IN N.B. AND N.S.

	New Brunswick tonnes (M)	Nova Scotia tonnes (M)
Avg. Aggregate Production:	9.065	10.735
Avg. Aggregate Consumption: (cement concrete and highway construction industries)	6.360	4.985

The production of aggregates figures were the most complete historic data set. Since most aggregate production is consumed within the province of origin* and the consumption per industry figures do not include all consumption activities, the production data will be used for the basis of the two forecasts to 2010. Table 2.4 presents the results of the two aggregate

---

*This is not true to the extent that approximately 250 thousand tonnes of crushed stone aggregates are exported to PEI primarily from N.S. and some from N.B. each year, and some N.S. aggregates were beginning export to the U.S. by the mid 1980s.

TABLE 2.2

AGGREGATE PRODUCTION AND CONSUMPTION*
(VOLUME 1 REPORT, TABLES 3.2, 4.5, 4.6, 4.7 AND 4.8)

Year	Pit and Quarry Aggregate Production		Aggregate Consumption by Industry			
			Ready-Mix and and Concrete Products		Highway Construction	
	N.B. tonnes (M)	N.S. tonnes (M)	N.B. tonnes (M)	N.S. tonnes (M)	N.B. tonnes (M)	N.S. tonnes (M)
1976	--	--	0.642	0.674	--	--
1977	--	--	0.488	0.688	--	--
1978	10.140	10.900	0.616	0.664	--	--
1979	8.380	11.620	0.664	0.715	--	--
1980	9.140	11.390	0.613	0.634	8.451	4.160
1981	8.600	10.380	0.648	0.738	4.212	5.750
1982	8.010	5.990	0.570	0.642	5.583	2.360
1983	7.390	9.440	0.683	0.705	4.381	4.830
1984	9.150	12.360	0.734	0.859	5.322	5.180
1985	11.710	13.790	--	--	6.122	3.440
1986	11.316**	11.912**	--	--	5.131	3.040
1987	12.115**	12.405**	0.629	0.702	6.623	5.480

* Sand and gravel and crushed stone aggregates
**Information from Canadian Minerals Yearbook, 1987. Not used for projections.

FIG. 2.3

AGGREGATE PRODUCTION FORECASTS

(PIT & QUARRY)

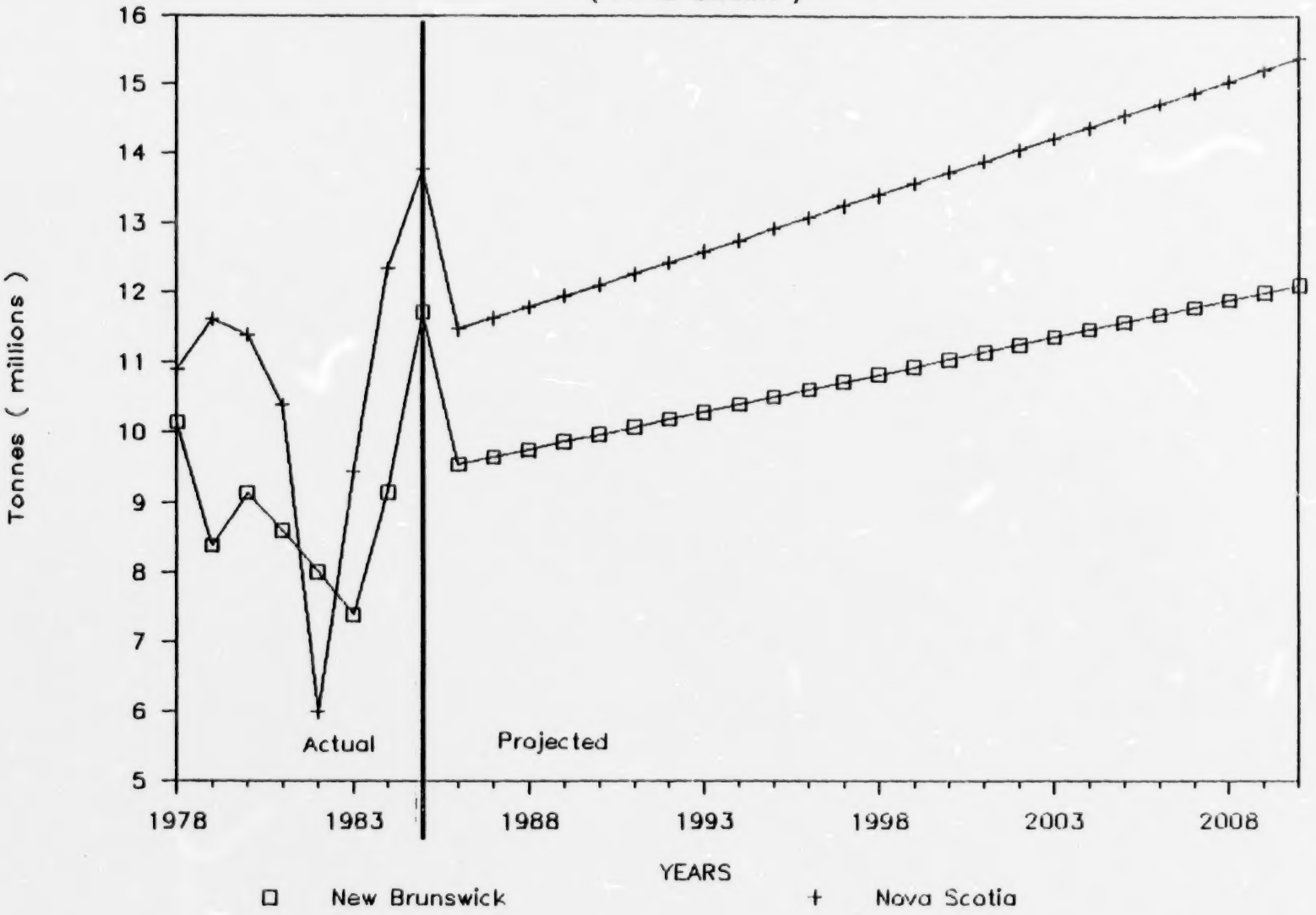


FIG. 2.4

AGGREGATE CONSUMPTION FORECASTS

(READY MIX & CONCRETE PRODUCTS)

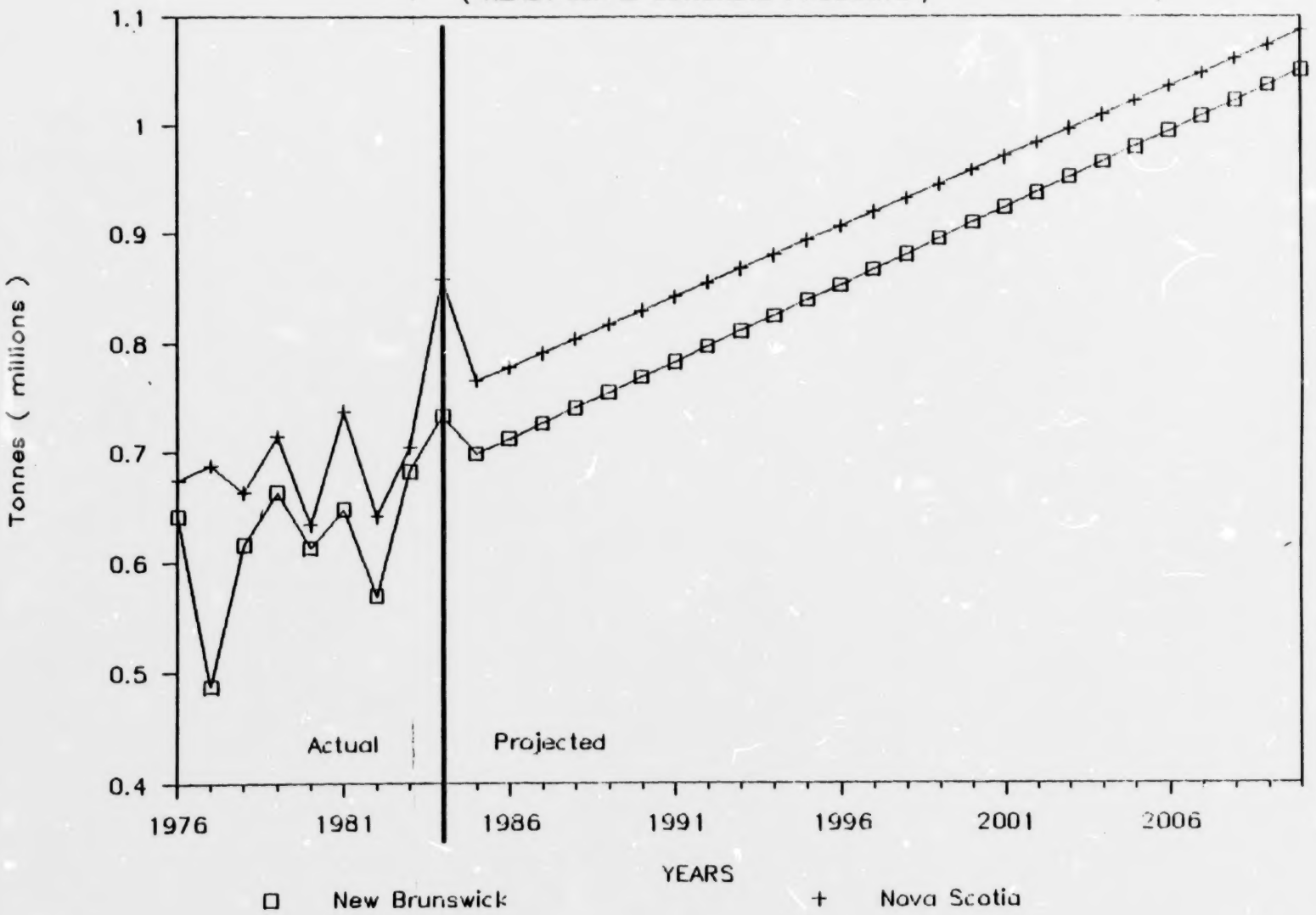


FIG. 2.5

AGGREGATE CONSUMPTION FORECASTS

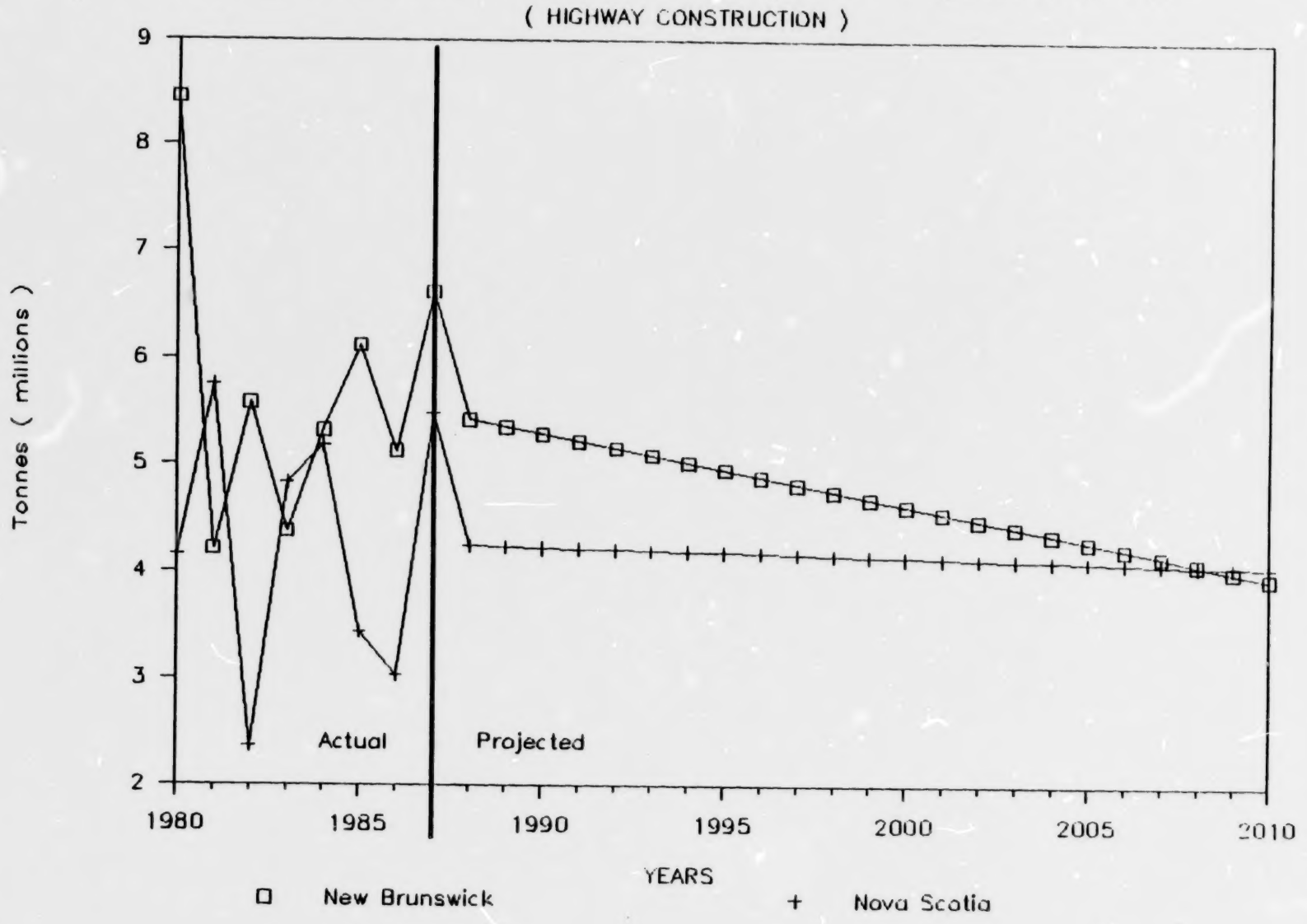


TABLE 2.4

AGGREGATE DEMAND FORECASTS

Year	Forecast 1*		Forecast 2*	
	N.B. tonnes (M)	N.S. tonnes (M)	N.B. tonnes (M)	N.S. tonnes (M)
1985	11.710	13.790	9.065	10.735
1990	9.975	12.120	10.010	11.850
1995	10.510	12.935	11.050	13.085
2000	11.045	13.750	12.200	14.450
2005	11.580	14.565	13.470	15.950
2010	12.120	15.380	14.870	17.610

*Forecast 1: historic "trend line projection"

Forecast 2: average historic annual tonnage projected at 2% per annum growth

demand forecasts. The results indicate that by the year 2010 demand for aggregates will be at 12.12 M tonnes by trend line projection (Forecast 1) and 14.87 M tonnes by 2 percent per annum growth (Forecast 2) in New Brunswick. Nova Scotia demand for aggregates are projected at 15.38 M tonnes by Forecast 1 and 17.61 M tonnes by Forecast 2 in year 2010.

Both of these forecasts have implicit assumptions of normal construction activity levels extended into the future. Mega-projects such as the proposed "fixed link" to PEI, or the new TCH alignment and upgrading project proposed in N.B. would be additional to the normal growth scenarios.

3.0 FORECAST OF SUPPLY

3.1 Aggregate Resources in New Brunswick

3.1.1 Overview

The quantity and quality of the aggregate resource in New Brunswick varies considerably between regions. The eastern portion of the Province has limited resource potential whereas regions such as Bathurst and Charlotte County have extensive resources. There are two major categories of aggregate materials: granular aggregate derived from surficial deposits of unconsolidated material (i.e., sand and gravel from pits); and crushed stone derived from bedrock quarries. Granular aggregate has a relatively low production cost since it typically can be extracted with a front-end loader. However, the commodity has a relatively low unit value and as such is sensitive to transportation costs. In regions where there are shortages of good quality granular material, it can be more economical to quarry bedrock material despite the higher costs associated with drilling and blasting. Such operations typically are located in proximity to high-demand urban areas such as Moncton and Fredericton. Table 3.1 presents information on the principal crushed stone quarries in the Province.

Aggregate potential is a function of the bedrock type in the area for surficial deposits as well as for quarries. The material in surficial deposits is derived from bedrock sources and transport distances typically are in the order of a few kilometres. Thus, in a broad sense the composition of surficial deposits can be related to the bedrock of the region.

TABLE 3.1

MAJOR CRUSHED STONE QUARRIES IN NEW BRUNSWICK

Company Name	Location	Bedrock Type
Diamond Construction Ltd.	Fredericton (Springhill Road)	sedimentary
Forbes and Sloat Ltd.	Fredericton (Douglas)	volcanic
Moncton Crushed Stone (Modern Construction)	Moncton (Stilesville)	granitic
H.E. Carson Ltd.	Moncton (Stilesville)	metasedimentary
Acadia Crushed Stone (Modern Construction)	Moncton (Gayton)	granitic
MacDonald Paving and Construction Ltd.	Moncton (Gayton)	granitic
Brookville Manufacturing Co. Ltd.	Saint John	limestone/ dolomite
Havelock Lime Works	Havelock	limestone
Elmtree Resources Ltd.	Bathurst	limestone
Government quarry	Minto (Hardwood Ridge)	volcanic
C.M. Stewart Co. Ltd.	Dalhousie	volcanic

The glacial processes and transport mechanisms are important factors in the quality of a surficial deposit. Less durable rock types break down during transport and constitute finer gradations whereas harder material tends to dominate coarser fractions. Material mechanically transported by ice action tends to be poorly sorted, compacted material known as till. Such deposits generally have low potential except for use as fill (borrow). Material transported by water during glacial times is generally of higher quality. Rivers flowing over, in, or under the ice produced well sorted deposits which were dumped on the landscape when the ice melted. Eskers, kames, and kame

terraces (collectively known as ice-contact deposits) are included in this group. The nature of these deposits is frequently similar to material deposited by present day rivers. Deposits of a similar nature (i.e., well sorted) were formed when rivers flowed off the ice mass and into a lake or marine waters. Similar present-day deposits are forming in river deltas. Deposits also accumulated in broad outwash plains as water flowed from the ice mass onto the landscape. These transport mechanisms occasionally result in longer movement distances for the source material but general relationships to bedrock geology usually are apparent. Figure 3.1 shows the general geology of New Brunswick with subdivisions into tectonostratigraphic zones. These zones and their aggregate potential are reviewed individually. Table 3.2 presents an overview of the discussions.

TABLE 3.2

GENERALIZED AGGREGATE RESOURCE POTENTIAL BY GEOLOGIC ZONE

Zone	Crushed Stone (Bedrock Quarry)	Granular Aggregate (Surficial Pit)
1. Edmundston	Low	Low to Moderate
2. Matapedia-Aroostook	Low	Low to Moderate
3. Tobique-Chaleur	Low to Good	Moderate
4. Elmtree	Moderate	Moderate
5. Miramichi	Low to Good	Good
6. Magaguadavic	Moderate to Good	Good
7. Caledonia	Moderate to Good	Moderate
8. Moncton Basin	Low to Good	Low to Moderate
9. Central Platform	Low	Low

The New Brunswick Department of Natural Resources has recently completed an extensive program which assessed the granular aggregate resources in all regions of the Province. A map atlas gives pit locations and the extent and nature of deposits. More

Figure 3.1 Tectonostratigraphic zones and general geology of New Brunswick (from Rampton et al., 1984).

detailed descriptions of individual pits are also available. This extensive data bank has considerable information in a specific context but provides limited information in an overview format. The discussions which follow are based on this information in combination with in-house knowledge and discussions with personnel of provincial agencies.

3.1.2 Review by Zone (see Figure 3.1)

Zone 1. Edmundston Zone. Bedrock in the zone consists of sedimentary rocks (micaceous slate and greywacke) of the Temiscouta Formation. This material is generally of low potential for crushed stone production. A few occurrences of intrusive rocks have been noted in the southwest of the zone and could have potential for quarrying.

Granular aggregate resources generally are not extensive but quantities are larger in the Edmundston area due to large deposits in the Madawaska, Green, Saint John and other river valleys. These deposits represent a considerable resource quantity but the quality may not be acceptable for some uses.

Zone 2. Matapedia-Aroostook Zone. Bedrock in the zone consists of sedimentary rocks including calcareous shales and slates and argillaceous limestones of the Matapedia Group and argillites, sandstones and limestones of the Grog Brook Group. This material has a low potential for crushed stone production.

Granular aggregate resources are substantial along the Saint John River Valley near the southern margin of the zone. The resource quantity is limited in the northern portion except for a few deposits such as the Kedgewick esker. A high percentage of unsound lithologies in the material limits its acceptability for some uses.

Zone 3. Tobique-Chaleur Zone. Bedrock in the zone is diverse and consists of siltstones, sandstones, and volcanic rock of the Chaleur Group, sandstones, siltstones, limestones and volcanic rocks of the Dalhousie Group, and granitic rocks. The sedimentary rocks dominate the zone whereas the volcanic and granitic rocks have a smaller extent. The potential for crushed aggregate production is a function of bedrock type. The volcanic and granitic units would have the best potential. The Stewart quarry near Dalhousie is situated in an intermediate to mafic volcanic (basaltic) unit in the northwest of this zone and is considered to be good quality. The Elmtree Resources operation quarries limestone on the northeast of the zone for use at Belledune Smelter but also produces some aggregate.

Granular aggregate resources are concentrated in the Charlo, Tobique River, Nepisiguit Lakes (inside Mount Carleton Park) and Juniper areas. Quality is somewhat variable but is acceptable for most purposes. Restricted distribution and ownership suggests some availability constraints, but population density is low.

Zone 4. Elmtree Zone. Bedrock in this small zone is characterized by gabbros, basalts, greywackes and slates of the Elmtree and Fournier Groups which have been intruded by granites. Potential for crushed stone production varies with rock type with some units expected to have good potential.

Granular aggregate resources are concentrated along the Elmtree River.

Zone 5. Miramichi Zone. Bedrock in the area consists of a complex group of metasedimentary and volcanic rocks of the Tetagouche Group which have been intruded by granitic rocks. The volcanic and granitic rocks have potential for quarrying.

Granular aggregate resources in the north of the zone are concentrated in the vicinity of the Nepisiguit River and supply the Bathurst area. Traditional sources in the Blue Mountain area are gradually being depleted. Substantial resources are available in areas such as Taylor Brook Road but transport distances are longer. In the area north of Newcastle extensive resources are found near the junction of the Northwest Miramichi and the Big Sevogle Rivers (Shaddick Lake, etc.). Additional reserves occur near the Southwest Miramichi (Redbank, etc.) and Renous and Dungarvon Rivers.

Zone 6. Magaguadavic Zone. The bedrock in this horseshoe shaped zone consists of an extensive band of sedimentary rocks with some volcanic units and extensive granitic plutons in the Pokiok and St. George areas. The Diamond Construction quarry near Fredericton is situated in a sedimentary unit and is of acceptable quality for most applications. The crushed stone potential of the bedrock is generally good.

Granular aggregate resources are concentrated in the Burtt's Corner - Zealand area, along the Nashwaak River, north of Nackawic, in the Magaguadavic Lake and River region, in the Blagdon-Nerepis area. Very large reserves are found in the Charlotte County including the St. George, Pennfield, and McDougall Lake areas.

Zone 7. Caledonia Zone. Bedrock in the zone consist of metasedimentary and metavolcanic rocks as well as younger volcanic and sedimentary rocks. Crushed stone potential varies with rock type but is moderate to good in most regions. The Brookville Manufacturing operation east of Saint John quarries a dolomitic limestone for agricultural lime and aggregate.

Granular aggregate resources are concentrated in the Big Salmon River area, near St. Martins, and in the Ben Lomond - Golden Grove area. Encroaching urbanization and proximity to developed areas is decreasing the availability of much of the material in the Saint John area. Additional bedrock quarries within the city have been proposed to provide alternative supplies.

Zone 8. Moncton Basin. Bedrock consists of sedimentary rocks including conglomerate, sandstones and shales, limestone, gypsum, and associated strata. The eastern portion of the basin is dominated by sandstones similar to Zone 9. The Havelock Lime operation quarries a limestone and produces some aggregate. Lafarge Canada Inc. also quarry limestone for aggregate. A block of older sedimentary and granitic rocks which has been upthrust by faults is found north of Moncton. The H.E. Carson and Moncton Crushed Stone quarries are situated in this unit. A small granitic intrusion is located at Gayton, east of Moncton. The Acadia and MacDonald quarries are situated in this unit. Other bedrock units in the Moncton area are considered to have low potential for crushed stone.

Granular aggregate resources in the western part of the zone are concentrated in the Sussex-Penobsquis area. Unsound lithologies in the material limits the acceptability of some of this material for high specification purposes. Granular aggregate reserves in the eastern portion are very low.

Zone 9. Central Platform. Bedrock in the region is characterized by flat lying sandstones and associated sedimentary rocks. The crushed stone potential of this material is low. Volcanic rocks occur along the margin of zone and have some potential. The Forbes and Sloat Ltd. quarry near Fredericton is in a volcanic flow unit and is considered acceptable for most applications. The "Government" quarry near Minto is also in a volcanic unit and is of good quality. Similar bedrock units

occur in this area and may also have potential. In the north-east of the zone an intrusive dyke extends southwest from Caraquet to the Wayerton area. The crushed stone potential of this unit has been evaluated but there has been limited usage. A relatively narrow extractable width limits potential. With the exception of the volcanic rocks in the Minto area and those on the margin of the zone, crushed stone potential is low. In some areas, weathered (shattered) sandstone bedrock is extracted for fill.

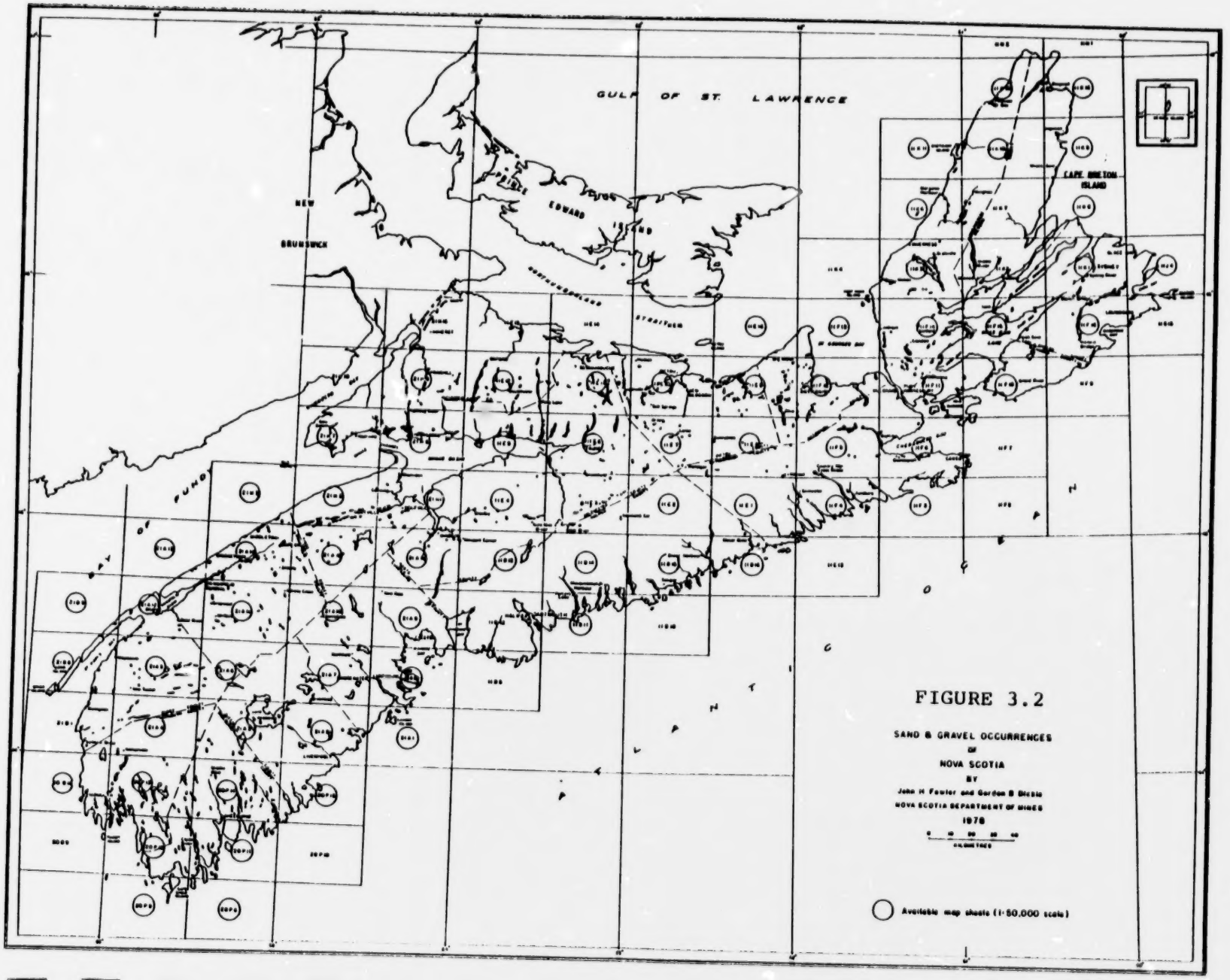
Granular aggregate reserves are also limited in this large zone. In general the area has less than 2 million cubic metres of material per thousand square kilometres. However, large quantities occur in an esker system west of Rogersville and other scattered localities. In the south of the zone deposits are found in the Blissville area.

3.2 Aggregates Resources in Nova Scotia

3.2.1 Overview

Field investigations undertaken over the past number of years by the Nova Scotia Department of Mines and Energy have indicated the presence of extensive aggregate deposits in the Province. Both surficial and bedrock materials suitable for aggregates have been delineated.

Surficial materials include ice-contact deposits, outwash deposits and tills with a sandy matrix. These deposits have been rather extensively used as aggregate sources. They vary considerably in quality from unacceptable to excellent (see Figure 3.2).


GULF OF ST. LAWRENCE
NEW BRUNSWICK
PRINCE EDWARD ISLAND
CAPE BRETON ISLAND
FUNDY
FIGURE 3.2
SAND & GRAVEL OCCURRENCES
OF
NOVA SCOTIA
BY
John H Fowler and Gordon B Bleiler
NOVA SCOTIA DEPARTMENT OF MINES
1976
Available map sheets (1:50,000 scale)

Bedrock areas suitable for producing crushed aggregates are widespread and have considerable development potential. The more productive geologic environments include the Cambro-Ordovician Meguma Group metaquartzites and Devonian granitoid rocks. High quality aggregates in the Halifax-Dartmouth Metropolitan area are produced from the former, while those at Porcupine Mountain near Mulgrave are produced from the latter.

There are currently no serious shortages of aggregates in the province. However, in some regions existing aggregate materials are in limited supply or do not meet required specifications. In these instances, suitable aggregates must be trucked in to satisfy the local demand.

An untapped source of aggregates exists offshore Nova Scotia. Preliminary studies suggest the presence of extensive sand, gravel, and sand and gravel deposits. These deposits, through reworking processes, are clean and free of deleterious material. However, the feasibility of this resource and possible conflicts with the fishing industry need to be examined to determine its viability.

Although the distribution of aggregate deposits is reasonably well known in Nova Scotia, there is little publicly available data regarding the quantity of material which these deposits contain. Individual operators would have to be queried for information on specific deposits, and it is questionable if would any be able to or even willing to provide details. Locations of potential source areas are a well guarded secret. Contractors are then able to use these sources to make their bidding more attractive for nearby projects.

Many operators, particularly the smaller ones, show only limited concern for reserves. They usually continue to operate until they begin to run out of suitable material and then become concerned. The major operators, however, are apparently more concerned about reserves now than they were in the past few years. This may be a reflection of the high costs of expansion capital, and the need to know the expected life of an operation before undertaking expansion, facility improvement or equipment purchases. Information on major sand and gravel pits and crushed stone quarries in Nova Scotia is presented in Table 3.3.

TABLE 3.3

MAJOR AGGREGATE PRODUCERS IN NOVA SCOTIA

	Company Name	Location	Markets
1.	Nova Sand and Gravel (L.E. Shaw Ltd.)	Shubenacadie	Halifax-Dartmouth Atlantic Region
2.	Permanent Concrete Ltd.	Folly Lake	Northern Nova Scotia
3.	Meadows Sand & Gravel Ltd.	Sydney	Sydney area
4.	Municipal Ready-Mix Ltd.	Sydney River	Sydney
5.	Malcolm S. MacDonald Co. Ltd.	Sydney	Sydney
6.	Rocky Lake Quarry Ltd.	Bedford	Halifax-Dartmouth
7.	Conrad Brothers Ltd.	Dartmouth	Halifax-Dartmouth
8.	Gateway Materials Ltd.	Dartmouth	Halifax-Dartmouth
9.	W. Eric Whebby Ltd.	Dartmouth	Halifax-Dartmouth
10.	Steed & Evans Ltd.	Dartmouth	Halifax-Dartmouth
11.	Construction Aggregates Ltd.	Mulgrave	Atlantic Canada and Eastern Seaboard and Gulf Coast regions of United States
12.	Levatte Construction Ltd.	Sydney	Sydney

3.2.2 Review by Region

Comments on the resources in the different regions of the province follow. These comments pertain to the potential of the various regions of the province, and are based on the assessment of the project team and discussions with Nova Scotia Department of Mines and Energy personnel.

Halifax-Dartmouth Metropolitan Area

Crushed Stone

Although some producers are possibly running short of suitable material, others have ample reserves, while still others are operating at below capacity. The potential for new quarries is excellent in areas of Meguma Group metagreywackes. However, inherent environmental problems, accessibility and distance from market combine to make some potential sites less attractive.

Sand and Gravel

Very little Pleistocene gravel is used in the Halifax-Dartmouth region. All coarse aggregates are quarried and crushed. Construction sand, mortar sand, etc., are currently being supplied from the Annapolis Valley, Gays River and Shubenacadie areas. The distance to market is considerable, but there are no other onshore alternatives. The offshore granular deposits mentioned earlier would, if developed, play an important role in providing sand and gravel for the region.

Annapolis Valley

Crushed Stone

This region generally lacks suitable rock types for crushing. Granite would be available from various phases of the adjacent south Mountain Batholith, but this material often does not meet the required specifications. This geologic environment currently supports only one small operation, apparently there is even a reluctance to use this granite in those instances where it does meet required specifications.

Sand and Gravel

Sand and gravel at such localities as Coldbrook, are believed sufficient to serve future markets both in the Valley and Halifx-Dartmouth regions.

Western Nova Scotia

Crushed Stone

There are currently no quarrying operations in the region. However, quartzites of the White Rock formation may be a good source rock. A potential problem with this material is that it is so hard that it could cause excessive equipment wear.

Sand and Gravel

Current reserves in the Plymouth area, near Yarmouth, are such that they may be of concern.

South Shore

Crushed Stone

Current production in this region is limited to a small crushing operation near Chester. The region has generally little potential because of unsuitable bedrock types. The ratio of slate to metagreywacke is considerably higher here than say in eastern Nova Scotia.

Sand and Gravel

Potential for deposits in the Bridgewater-Lunenburg area is poor. West of Liverpool a number of eskers show some potential. There is good potential for sand deposits in the Shelburne area.

Northern Nova Scotia

Crushed Stone

The bedrock type, sedimentary rocks of Upper Carboniferous age, precludes quarries of crushable material in the northern portion of this region. Quarries in volcanic rock at Folly Lake are thought to have excellent reserves. Presently the existing operation is not operating at capacity.

Sand and Gravel

The operation at Folly Lake supplies most of the current requirements for this region (Truro-Amherst), and should be capable of meeting demands of the immediate future. There is little or no potential for suitable material in the northern part of the region (Amherst-Pugwash area). However, there are large sand and gravel deposits at various localities along the south side of the Cobequid Mountains, an igneous, metamorphic and sedimentary complex.

Northeastern Nova Scotia

Crushed Stone

The current reserves may be limited; however, some volcanic rocks in the Antigonish Highlands may be a potential source for crushed stone to supply the New Glasgow-Antigonish market.

Sand and Gravel

Long established operations in the Pictou-New Glasgow area may have limited life. However, substantial reserves have been recognized in the James River area, between New Glasgow and Antigonish.

Eastern Shore

Crushed Stone

The area is considered to have good potential for crushed stone with Meguma Group metagreywacke being the dominant source rock. However, there is little present or projected local market.

Sand and Gravel

There are a few small sand and gravel deposits scattered throughout this region. Currently, very small markets.

Strait of Canso

Crushed Stone

Ample reserves at Porcupine Mountain should meet future requirements for this region as well as permit export of material at the current if not expanded rate.

Sand and Gravel

Sand and gravel for this region is currently being supplied from the Orangedale-Baddeck area. Reserves in the latter areas are believed to be substantial.

Sydney - Glace Bay

Crushed Stone

The rather extensive occurrences of quartzite of the Precambrian George River Group have potential as possible source rock. Consideration is currently being given to this possible resource. Additionally, some consideration has been given to carbonate rocks belonging to the same geologic group of rocks. Any future developments in this region setting could be confronted with environmental problems.

Sand and Gravel

Although long established operations may have limited reserves, other, more distant sources are being considered for development. The offshore granular deposits mentioned earlier and their proximity to the region would, if developed, play an important role in providing sand and gravel for the region.

Central Cape Breton Island

Crushed Stone

A very small market. For instance, concrete needs are currently being supplied from the Sydney-North Sydney area.

Sand and Gravel

There are ample reserves in the Baddeck area to supply future regional requirements.

4.0 MARKET TRENDS

4.1 Introduction

The forecasts provided earlier in this report are based upon the extension of current conditions into the future. However, conditions can change. Although aggregate markets are unlikely to experience great changes in demand, it is a useful exercise to review what trends or developments could affect them in the future.

Presented below are brief reviews of several trends and developments which could affect the quantity, quality or price of aggregates demanded in the market. The trends and developments are grouped according to their origin: economic, social, structural, technological, local and environmental.

4.2 Economic Trends

4.2.1 Growth Patterns

Background. Except for megaprojects, most aggregate consumption occurs near large urban areas and areas of construction activity. High quality aggregates (asphalt aggregate, concrete aggregate) in particular are in demand.

Assessment. Halifax-Dartmouth, Moncton, Saint John and Fredericton should continue to be the major urban centres and growth areas in New Brunswick and Nova Scotia. Halifax-Dartmouth is the largest urban centre in the Atlantic Provinces and has many of the area's regional offices. Strong government (provincial, defense) and institutional (universities, technical

schools, hospitals) sectors provide a steady base to the economy which also has large industrial service, tourism, energy and transportation components. The Halifax-Dartmouth area should continue to be a major consumer of aggregates for the foreseeable future and be dependent upon overall economic conditions.

While Halifax-Dartmouth is definitely the centre of Nova Scotia, Saint John, Moncton and Fredericton share the leadership role in New Brunswick. Saint John is the industrial centre of New Brunswick with strong port, forestry, and petrochemical components. The city also has institutional strengths. Aggregate consumption in Saint John will be dependent upon its industrial prosperity.

Moncton benefits from its location. Rail, truck and car traffic for most of Prince Edward Island, Nova Scotia and Newfoundland passes through the Moncton area. As a result, the city has become a major commercial and distribution centre. The city has a significant tourism component, some federal government offices and is the centre of Acadian cultural institutions. Aggregate consumption in Moncton will follow the prosperity of the Atlantic Region.

Fredericton has a stable economic base of government, services and institutions. Less affected by economic cycles, Fredericton should remain a steady consumer of aggregates in the future.

Sydney, Bathurst, Port Hawkesbury, Truro and Sussex are smaller centres which could experience substantial growth in the future. The first three have a strong industrial base which should expand further depending upon world markets. The latter two have excellent locations and strong farm economies.

4.2.2 Megaprojects

Background. There is now a more cautious attitude toward large engineering projects than there was in the 1950s and 1960s. Now most projects are scrutinized for environmental, social, and economic impacts in the preliminary design process.

However, many such megaprojects have been proposed and many have been built. Design constraints are tighter and the process takes longer, but dams, bridges, power plants and marine facilities are still required.

For New Brunswick and Nova Scotia there are four megaprojects which could require very large quantities of high quality aggregates:

- New Brunswick to Prince Edward Island Fixed Link;
- New Brunswick Trans-Canada Highway;
- Off-shore Petroleum Development; and
- Bay of Fundy Tidal Power.

In addition, there are many smaller projects planned or committed in the two provinces, such as harbour improvements and roadway upgrades.

Assessment.

1) The Fixed Link, if built, would-be either a bridge or a tunnel and require large amounts of concrete, road bed material, and armour stone. After years of low interest, the Federal Government announced its intention in 1986 to support the study of a fixed link funded by nongovernment sources. The estimated capital cost for this project is close to one billion dollars.

A decision to proceed or not will be made within a few months. If the project does proceed, most of the aggregate material will come by truck from the Moncton area or by boat from the Strait of Canso area.

The project is a priority item with the present Federal Government.

2) New Brunswick's Trans-Canada Highway is inadequate for existing conditions and will become more inadequate as traffic flow increases and the existing road bed and pavement deteriorates. Current proposals call for a totally new road of four lanes following a new route. The cost would be hundreds of millions of dollars.

This project will definitely proceed in some form. The Trans-Canada Highway is the primary road link between the Atlantic Provinces and the rest of North America. It has deteriorated to the point where maintaining even a basic level of service will cost several million dollars.

Providing aggregates for the new highway would be a major project, as much of the proposed route is through low, wet topography with little local aggregate resources (the Woodstock to Moncton corridor, for example). Pits and quarries in Moncton, Fredericton and the Upper Saint John River Valley would be primary sources of material.

A four-lane Trans-Canada Highway is a high priority item with the existing New Brunswick Provincial Government.

3) Among the designs for drilling and production platforms for off-shore petroleum development are several using rock foundations or built with concrete.

Most of this material would be built with crushed stone quarried from the Nova Scotia or Newfoundland shorelines and barged to the platform locations.

4) Fundy Tidal Power is not being promoted heavily at present. The demonstration plant at Annapolis Royal has been controversial, especially with respect to its environmental effects. A much larger project in the Minas or Cumberland Basins would be very expensive and require very thorough environmental assessment.

Aggregate quantities for a tidal plant would be very large with most of the material coming from southern Cumberland County and Folly Lake in Nova Scotia.

4.2.3 Exports

Background. There is an increasing need for inexpensive, good quality aggregates in the United States. The need is most acute in the Gulf of Mexico states of Texas, Louisiana, and Florida where there is a shortage of native crushed rock. However, the eastern seaboard from Boston to Washington, DC faces a shortage as well. There the problem is the growth of urban area and the resultant loss of quarry sites to land development and environment constraints.

In both situations, high trucking costs and low shipping costs favour the development of shore side rock deposits even at locations as distant as the Maritimes, and even Scotland. Some of the American demand is already being met by the Construction Aggregates quarry at Mulgrave, but there is potential for much greater export production, possibly several million tonnes per year.

Assessment. The effects of a large volume of aggregate exports upon the local market would be significant:

a) Producers with shore side rock deposits could develop large quarrying, processing, and shipping facilities. Producers, employees, shippers and governments would benefit.

b) Consumers within the Maritimes would be forced to bid against consumers from outside the region. Prices could increase, perhaps substantially, if demand exceeded production. Higher prices could hinder development in the region.

c) Aggregate supplies could become scarce as high quality, easily accessible deposits become depleted serving the export market.

4.2.4 United States - Canada Free Trade

Background. The proposed Free Trade Agreement between Canada and the United States will eliminate or significantly reduce trade barriers on a wide range of goods and services.

Proponents of the agreement forecast an increase in trade along north-south trading routes and a resultant increase in prosperity. Opponents of the agreement forecast a reduction in Canadian manufacturing and processing industries as Canadians become suppliers of raw materials in American industry.

Assessment. Free trade in aggregate currently exists between Canada and the United States. Thus, the agreement will not directly affect existing market conditions.

However, the agreement could affect aggregate trade significantly in an indirect manner. With the publicity and increased movement of goods and services, American aggregate consumers could alter their perception of Canadian aggregate suppliers. At present Canadians are often seen as foreign, although friendly suppliers; after Free Trade they could be perceived as partners--and more reliable as a result.

Thus Free Trade could increase aggregate exports by changing the perception of market conditions by American consumers, not the actual conditions.

4.3 Social Trends

4.3.1 Increased Renovation and Rehabilitation

Background. In most cases, it is less expensive to renovate than to build from nothing. Often older structures have materials and details which cannot be economically replicated in new construction. Many of the older cities in North America (Halifax, Saint John, Boston, Montreal) have experienced extensive renovation of old homes, warehouses and office buildings.

Assessment. Renovation requires less aggregate than new construction as much of the structural frame of the building or bridge is kept intact. However, there is only a limited stock of older buildings which can be renovated. This trend will marginally slow the rate of aggregate consumption for low quality material.

4.3.2 Recycling

Background. Recycling is a common practice for many materials, especially high-valued metals and minerals. In recent years even low-valued minerals such as asphalt and concrete have been recycled as raw materials supplies become scarce or expensive.

Asphalt recycling is primarily intended to recover the asphalt cement. Aggregate recovery is a side benefit but one which can represent significant savings in regions with little or no aggregate resource. The recycled asphalt is used as a base course with recovered aggregate mixed 50-50 with new aggregate. The practice is becoming more popular and provides 10-20 percent of the highway aggregate requirements where it is established.

Waste concrete is crushed and used as fill and aggregate for a variety of uses. Crushed brick is used for landscaping. These applications are driven by the high cost of bulk waste disposal in many urban areas and the relatively high cost and low availability of virgin material.

Assessment. Recycling will continue to grow as a means of reducing waste and supplying scarce materials. The rate of growth will depend upon the ability of recyclers to provide quality material free from contaminants. It is relatively easy to provide quality material from asphalt recycling but recycling of road beds, for example, requires considerably more processing. Thus, recycling will become significant when:

a) the recovered material is relatively easy to recycle into quality products; and

b) the recycled products have a relatively high unit value.

4.4 Structural Trends

4.4.1 Corporate Integration

Background. For some large consumers of aggregate it could be quite beneficial to have their own source of aggregate. The benefits could include reduced aggregate costs, higher overall profits, control over aggregate supply, and maintaining of confidentiality of consumption information. Among the problems the new producers could experience are inefficiencies due to inexperience resulting in higher production costs, more wastage, increased labor problems, and so on.

Integration is quite common in the industrial minerals industries. Examples include clay-bricks (Shaw), limestone-lime (Havelock), and gypsum-wallboard (National Gypsum). In aggregates, it is less common; however, several quarries in New Brunswick are owned and operated by companies which are also contractors (Modern Construction) or manufacturers of concrete products (Shaw).

Assessment. The same factors which foster corporate concentration in aggregate production could push integration as well. However, the aggregate industry is unlikely to be highly integrated because 75-90 percent of all consumption is by the provincial Departments of Transportation which are unlikely to produce high quality aggregate (as opposed to fill) on a regular basis.

4.4.2 Corporate Concentration

Background. There is a trend towards corporate concentration in the aggregate supply industry, especially in the crushed stone segment. Several developments are pushing the trend:

- aggregate resources are becoming scarcer and more expensive;

- development costs are rising because of stricter environmental and public health regulations;

- more and more processing is required to meet more stingent consumer requirements; and

- sometimes several aggregate reserves have to be developed to provide a complete range of products.

Under the circumstances, producers require large cash sources which small producers can muster only with difficulty. As a result, aggregate production becomes more concentrated with a few large producers rather than many small producers.

Assessment. In New Brunswick and Nova Scotia concentration is most noticeable in the production of higher valued crushed stone materials. These materials cost more to produce but have a higher level of value added and profit.

A further point: it will be the large producers of higher valued crushed stone materials who will benefit most from mega-projects, not small sand and gravel operators. Megaprojects require large quantities of good quality material, which is most easily supplied by large producers.

In the future large producers, through expansion and acquisition, should account for an increasing proportion of aggregate production.

4.5 Technological Trends

4.5.1 Technological Improvements - Production

Background. The production process for sand and gravel and crushed stone is short and simple relative to most mining operations. However, technological advances have the potential to allow aggregate producers to produce material more efficiently, more cheaply and with less disruption.

Examples of technological advances include:

- improved blasting techniques which produce a better product and reduce neighbourhood disruption;

- the use of automation and numeric controls to monitor and control aggregate processing operations (crushing, screening, washing, loading); and

- improved geophysical surveying and mapping techniques which can provide information on aggregate resources more quickly and accurately.

Assessment. These technological benefits come with a high capital cost. Aggregate producers will require capital resources and forward thinking to benefit from technology. Again, the trend favours large firms over small.

4.5.2 Technological Developments

Background. Alternative materials and improved construction techniques could reduce the quantity of aggregate required for each project. Geotextile fabrics, for example, help to

stabilize slopes and maintain the integrity of roadways. Rock anchors and soil cement construction reduce the volume of material which must be excavated and replaced for many projects.

On the other hand, low-cost aggregates are often the alternatives which replace other, more expensive materials. Concrete has replaced steel in many structural applications. Chipseal paving has replaced asphalt on many secondary roads.

Assessment. Technological developments should increase aggregate consumption by expanding the range of applications for substitution by aggregates.

4.6 Legal Developments

4.6.1 Safety and Health

Background. The entire mining industry has received close scrutiny by health and safety officials in the last twenty years. Sand pits and stone quarries can be dangerous places to work, and regulations to protect workers have become more stringent.

Assessment. Safer equipment, employee training and more careful mining procedures have saved lives and reduced injuries. These measures have also increased operating costs. As with most cost increases, the effect is generally more negative on the smaller operations.

4.7 Environmental Developments

4.7.1 Land Use Conflicts

Background. Aggregates are a relatively low value commodity and very dependent upon transportation costs. For this reason, more producers try to develop their pits and quarries as close to the consumers as geology will allow.

However, in many urban areas such as Halifax-Dartmouth and Saint John, growth has occurred rapidly, covering many good deposits of agregate and surrounding several established aggregate operations. This growth has created land use conflicts, most of which are lost by aggregate producers. Dust, noise, blasting damage and truck traffic make existing or proposed pits and quarries unpopular neighbours for most suburbians.

Thus, many aggregate producers face a difficult tradeoff between the economics of their business and the demands of their neighbours.

Assessment. Producers cannot change the source of the land use conflicts (urban growth) but they can change public perception regarding the role of pits and quarries in the conflict.

Public education programmes would inform neighbours and the general public about the importance of inexpensive, good quality aggregates to the growth and prosperity of their community.

Good neighbour policies by producers could reduce the occurrence of dust, noise, traffic, and blasting damage through good site maintenance, careful scheduling, fences, and modern technology.

Through planning producers could anticipate future urban growth patterns and prevent conflicts by creating buffer strips.

4.7.2 Environmental Pressures

Background. At one time, sand and gravel were frequently removed from beaches in Nova Scotia and New Brunswick. Now that practice is not permitted. Further environmental regulations have restricted the development and operation of pits and quarries, and eliminated many potential aggregate-production sites.

Environmental regulations and restrictions are likely to become more strict in the future for several reasons. Public opinion favours a clean environment which is disturbed as little as possible by industry. Political will follows public opinion: most environmental issues are supported by left- and right-wing politicians. Finally, experience has shown that environmental regulations often make economic sense, heading toward the recovery or recycling of valuable resources.

Assessment. In the future aggregate producers will find that it takes longer and costs more to develop pits and quarries. It has been estimated that it could take ten years to develop a quarry in the United States. Among the new costs that producers face are buffer zones, noise or sight screens and closure landscaping.

Fewer sites will be available for development under the new environmental regulations, as large band areas are designated as parks and green belts. Producers will have to select sites with care and likely sponsor environmental assessments.

More pollution control measures will be required at pits and quarries. Dust control, collection of dirt from aggregate washing, collection of topsoil and spoil, and better fuel storage are among the measures.

Public relations will become an important management responsibility for many pit and quarry owners.

4.7.3 Offshore Dredging

Background. Water is an excellent means of mining and sorting aggregates. For many years, beaches served as a source of sand and gravel. Then governments passed regulations to restrict the practice. Now several firms are proposing to dredge aggregates from the sea bed. The proponents have been most successful in southern California and the United States eastern seaboard where good quality aggregates are becoming expensive and difficult to obtain.

Assessment.

Large scale dredging of offshore aggregate deposits could have created severe competition for operators of pits and quarries. To be economic offshore dredges would need to supply large quantities of material. In turn, the large supplies could flood the market and substantially reduce prices.

However, it is more likely that offshore dredging will be controlled closely by governments in the interests of fishing, environmental protection, tourism and the existing onshore aggregate industry. In some cases dredging might be forbidden.

It is unlikely that dredging for aggregates will be widely practiced in New Brunswick and Nova Scotia for many years. However, if it is introduced on the United States eastern seaboard, it would compete with material from New Brunswick and Nova Scotia and likely reduce exports.

4.8 Summary

Table 4.1 presents a descriptive summary of the trends which could affect the aggregate market in the future. As mentioned earlier, these trends are incremental to straight line extension of current conditions presented in Section 2.0 of this report.

Quantity. The quantity of New Brunswick and Nova Scotia aggregates demanded will be increased by four developments: megaprojects, exports, Free Trade, and technological improvements-production. Quantity will be reduced by three trends: increased renovation and rehabilitation, recycling, and offshore dredging. Taken together these trends indicate an increase in the quantity of aggregates demanded above the straight line projection of current conditions.

Quality. Four trends will tend to increase aggregate quality requirements: megaprojects, exports, free trade and technological improvements. No trends tend to reduce quality requirements. Thus there will be an increased demand for quality in the future.

Price. Nine trends will tend to increase the price for aggregates: megaprojects, exports, Free Trade, corporate integration, corporate concentration, technological improvements-production, safety and health, land use conflicts and environmental pressure.

Only one trend could lower prices below the straight line values: offshore dredging.

In conclusion, it is likely that price and quality demands will grow faster than aggregate production. Good quality aggregates will be harder to find, harder to mine, and more expensive.

TABLE 4.1

DESCRIPTIVE SUMMARY OF THE EFFECTS OF SHORT-TERM AND LONG-TERM DEVELOPMENT ON AGGREGATE MARKETS

Trend	Quantity Demanded	Quality Demanded	Price
Growth patterns	0	0	0
Megaprojects	++	+	++
Exports	+	+	+
Free Trade	+	+	+
Increased renovation and rehabilitation	-	0	0
Corporate integration	0	0	+
Corporate concentration	0	0	+
Technological improvements - production	+	++	+
Technological developments	+/-	+/-	+/-
Recycling	-	0	-
Safety and health	0	0	+
Land use conflicts	0	0	+
Environmental pressures	0	0	+
Offshore dredging	-	0	-
Summary	2+	5+	8+